2011

Research at the Pine Island Glacier Ice Shelf

Borg, Scott

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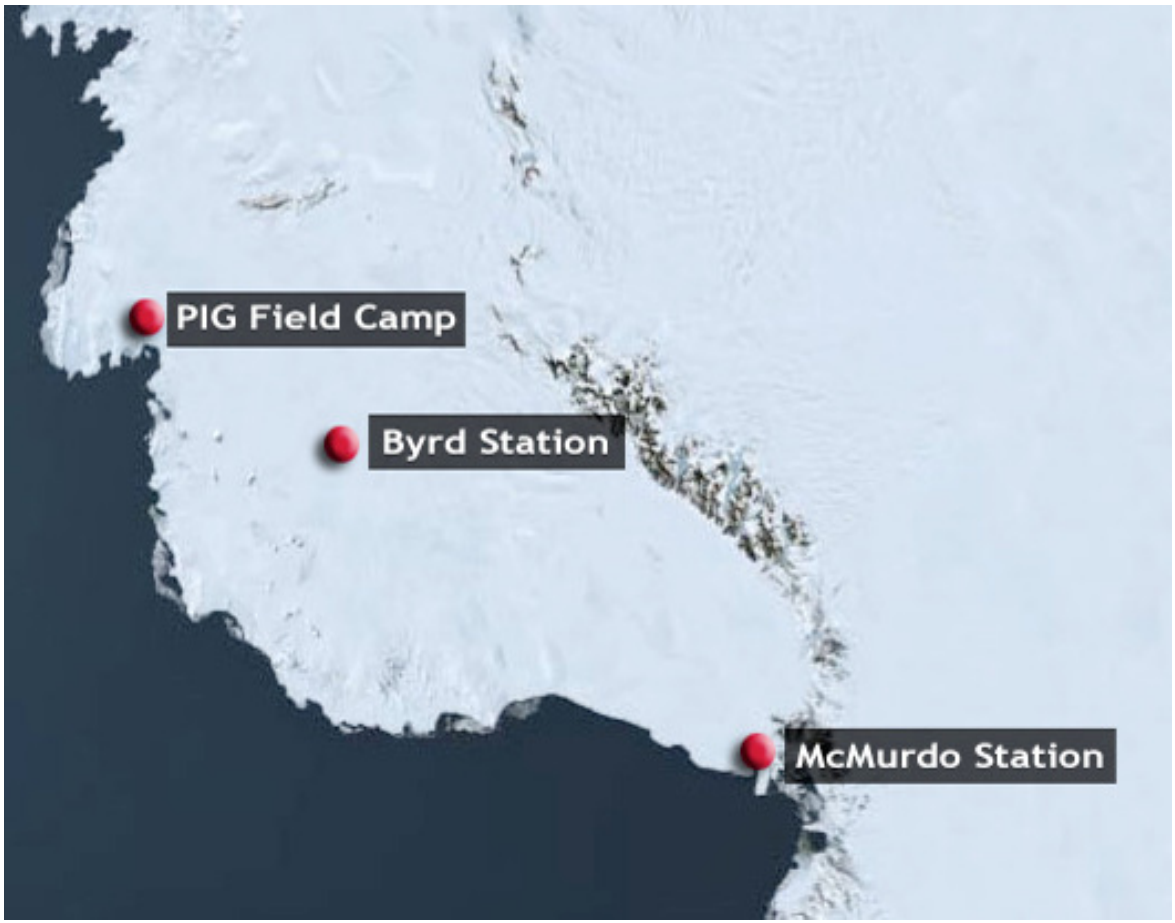

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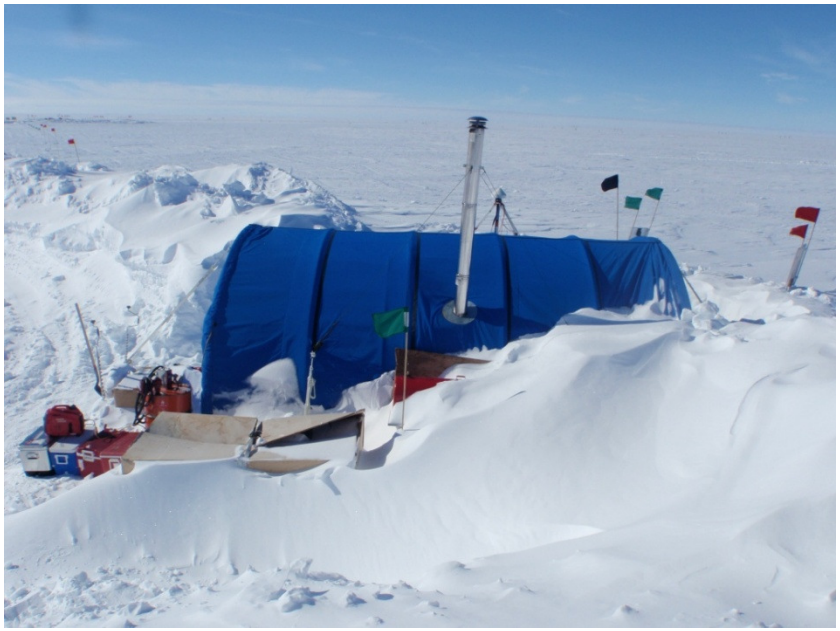
Sridhar Anandakrishnan

The Pennsylvania State University



Pine Island Glacier (PIG) Research Team:

Robert Bindschadler (NASA Emeritus)

Timothy Stanton (Naval Postgraduate School)

Sridhar Anandakrishnan (Penn State University)

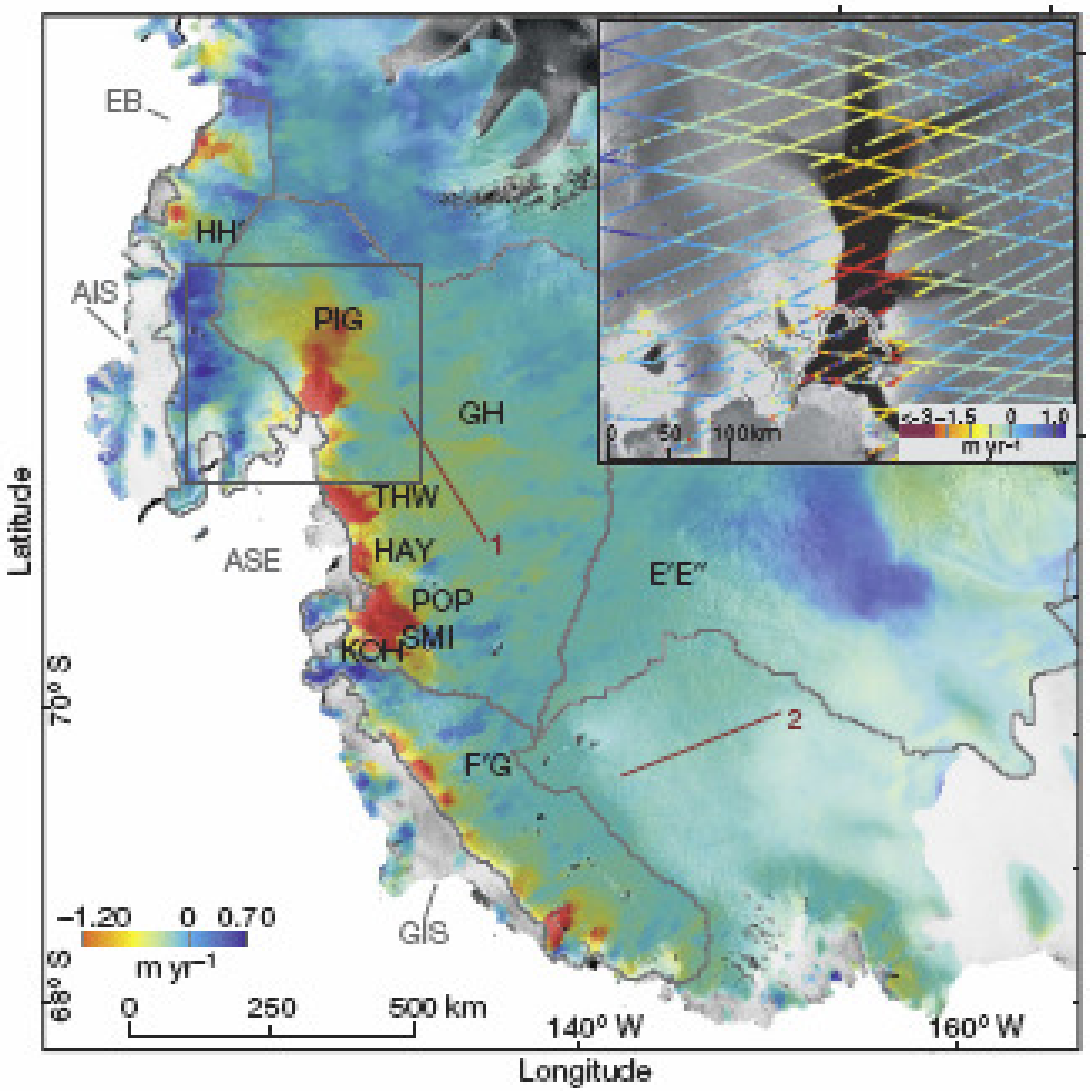
Alberto Behar (Arizona State University & JPL)

David Holland (New York University)

Miles McPhee (McPhee Research Company)

Martin Truffer (University of Alaska)

Measured elevation changes from ICESat

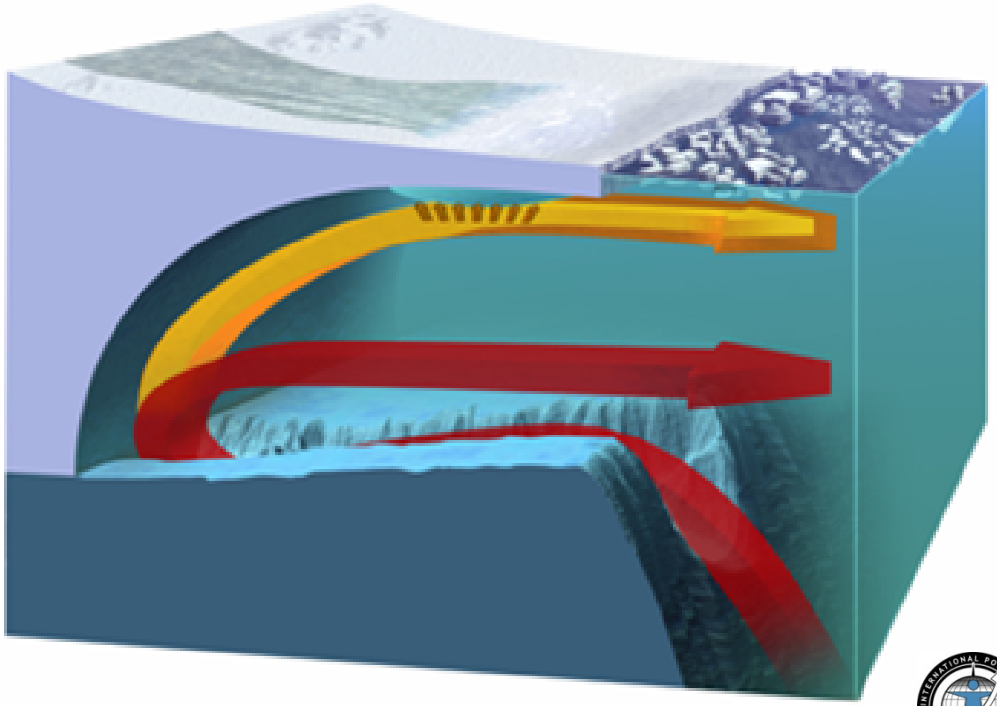


(from Pritchard and others, 2009)

- Amundsen Sea outlet glaciers are responsible for 7% of global sea level rise
- PIG is the fastest moving and fastest melting glacier of the group
- Pattern of change suggests ocean is the trigger

Direct measurements of ocean-ice interaction are required

- How much warm water is reaching the ice shelf?
- How cool/fresh is it when it leaves?



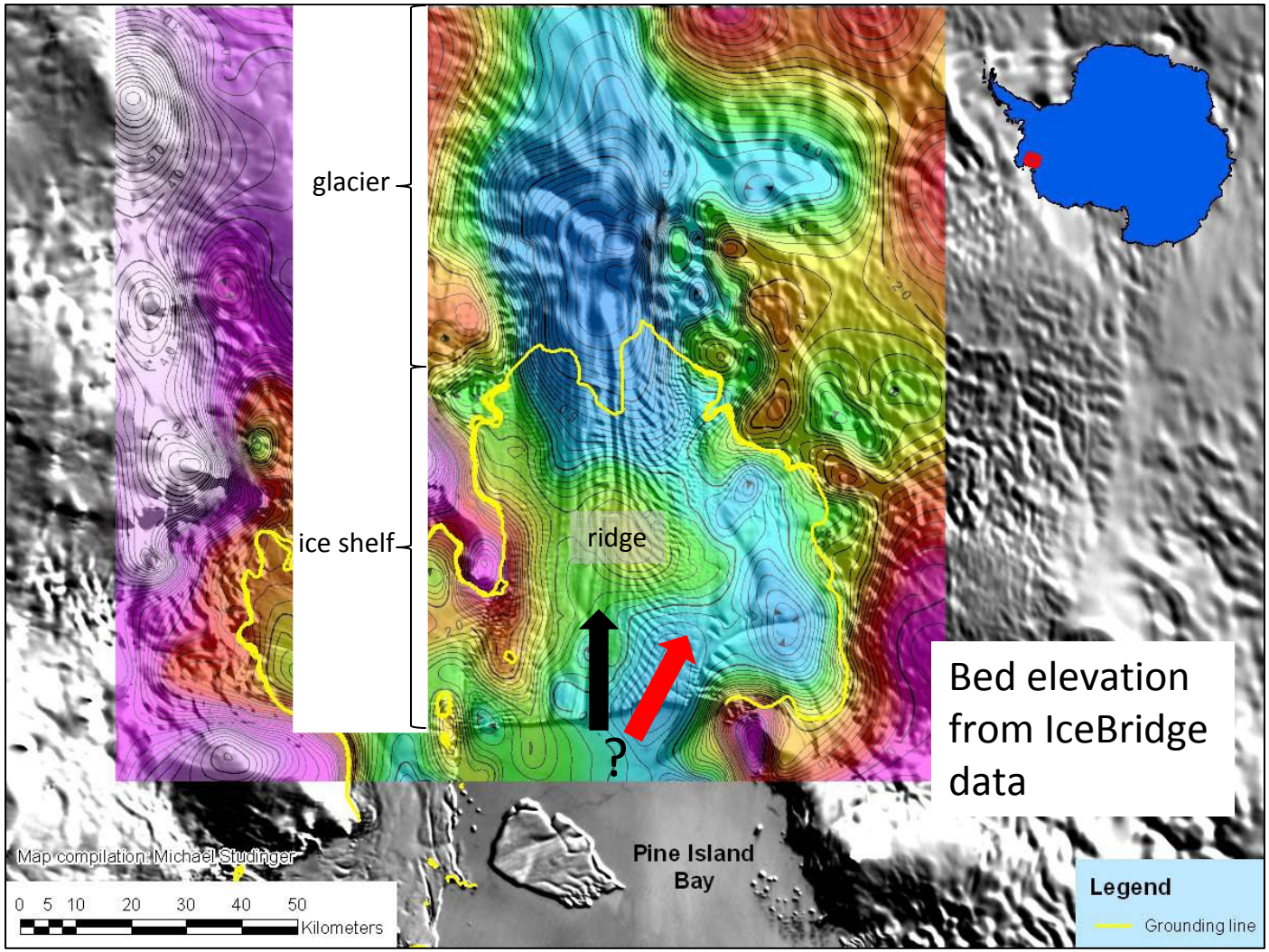
Multidisciplinary proposal accepted in 2006 (NASA) and 2007 (NSF)

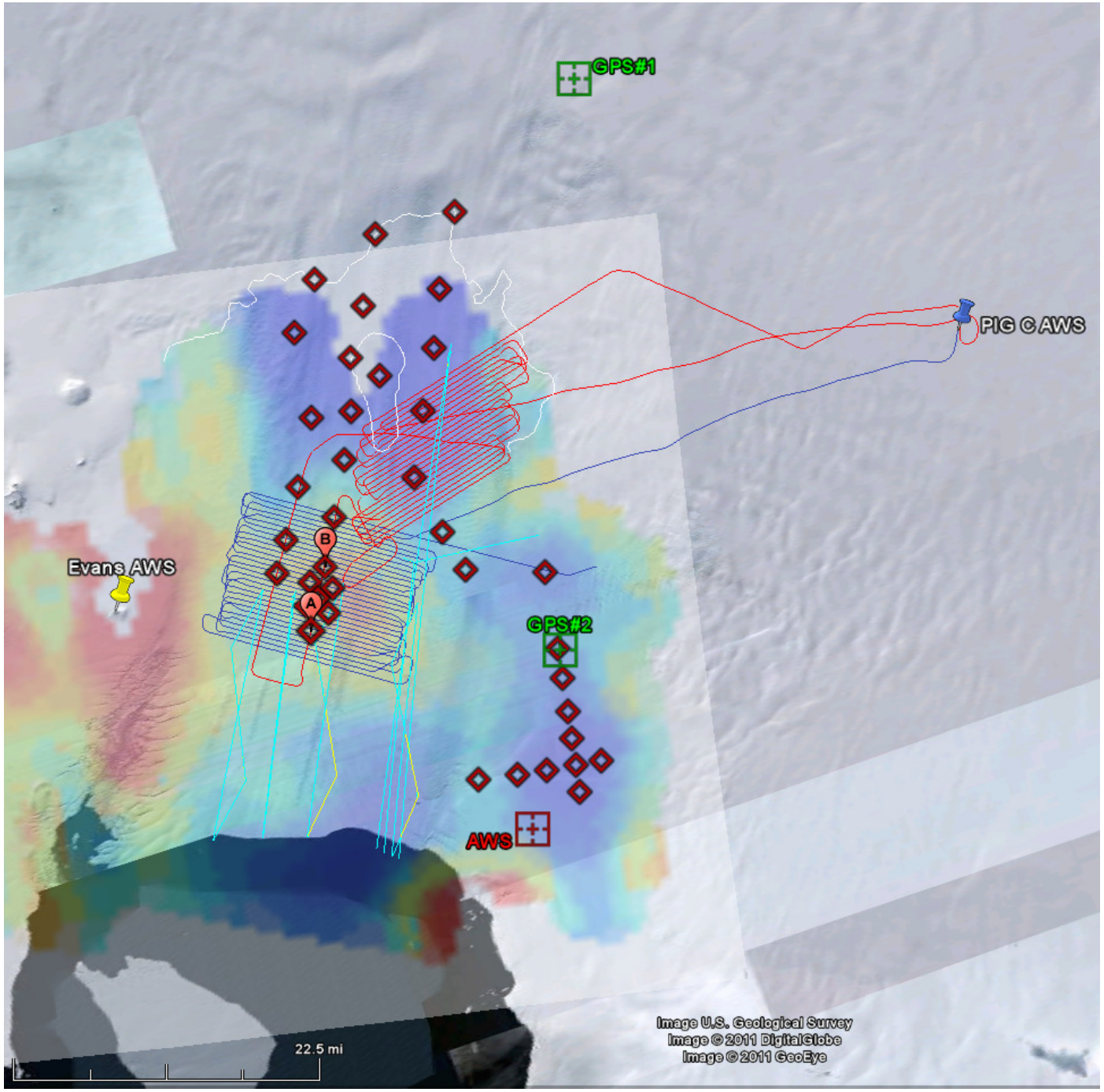
Initial landing on PIG ice shelf in January 2008 determined field work requires helicopter support

Autosub discoveries (2009): submarine ridge 350 meters high & warm water exists beneath the PIG ice shelf

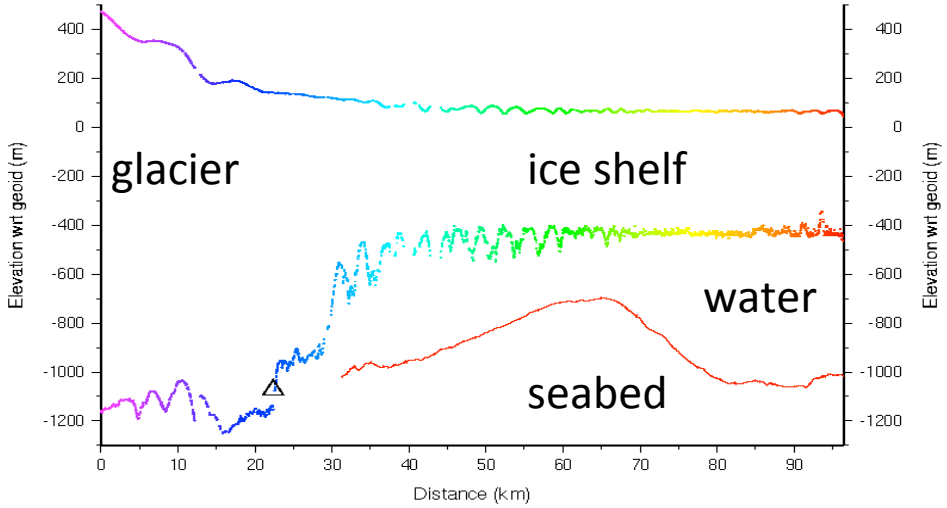
Major surface field work on PIG ice shelf to start December 2011 (2 seasons planned)

What pathways does the water take to reach the ice?

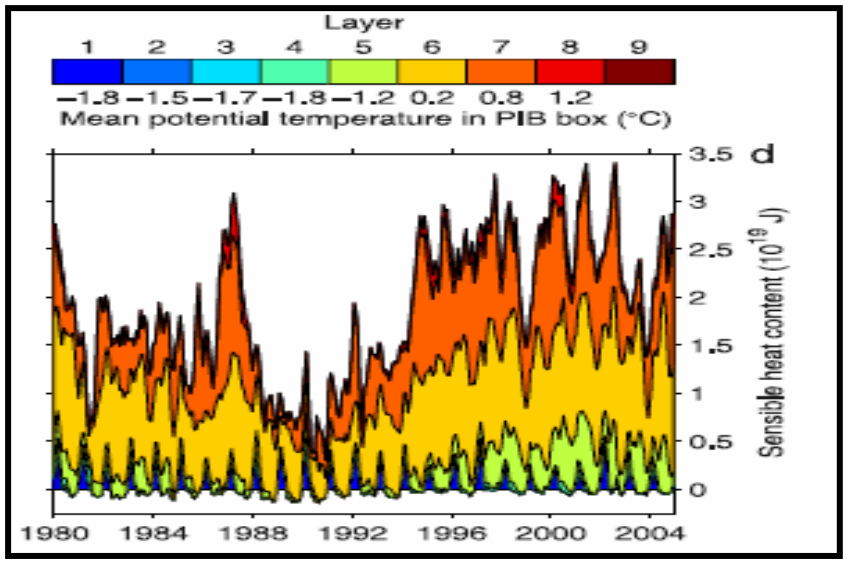




- PIG region (shown in Google Earth using LIMA imagery with colored NASA bathymetry)
- Balloons A and B are drill locations
- Diamonds mark planned geophysics sites
- PIG C is helicopter base and AWS location
- Blue and red lines are BAS flightlines
- Cyan lines are Autosub cruise lines



Vertical cross-section of PIG ice shelf
(from Bindschadler and others, 2011)



Total water column heat adjacent to PIG ice shelf
(from Thoma et al., 2008)

Modeled changes in ocean heat have been matched with thickness variations of ice shelf, but…

- How much ice is melting and how does it vary?
- How does the ice flow react to changes in the incoming water?